Lenses

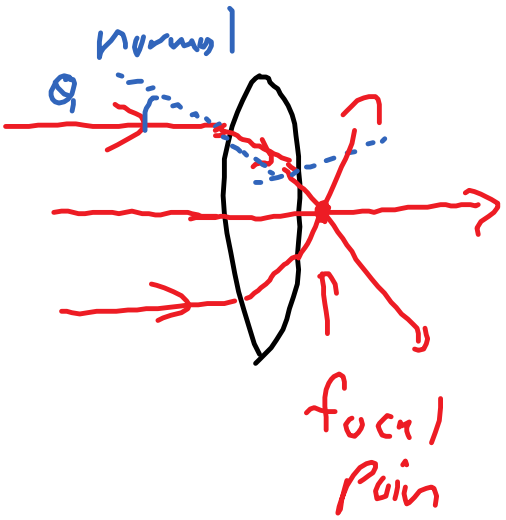
Quiz Tuesday May 30th

Recall
convex mirror - image is upright, smaller and virtual - not formed by rays directly.
focal length is negative.

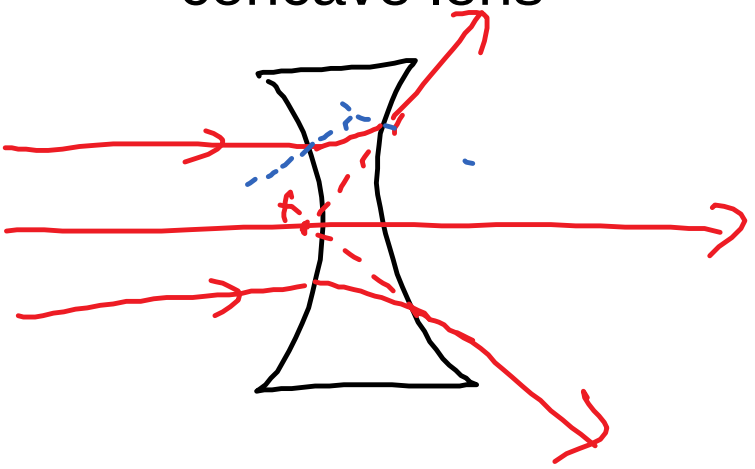
concave mirror - image is
a) do>f then it is flipped and real
b) do<f the upright, enlarged and virtual

Lenses - light refracts as it goes from air into glass.

convex lens



concave lens



whereas a convex mirror is diverging and a concave mirror is converging, it is reversed for

lenses.
convex lens is converging (rays come together)
concave lens is diverging (rays spread apart)

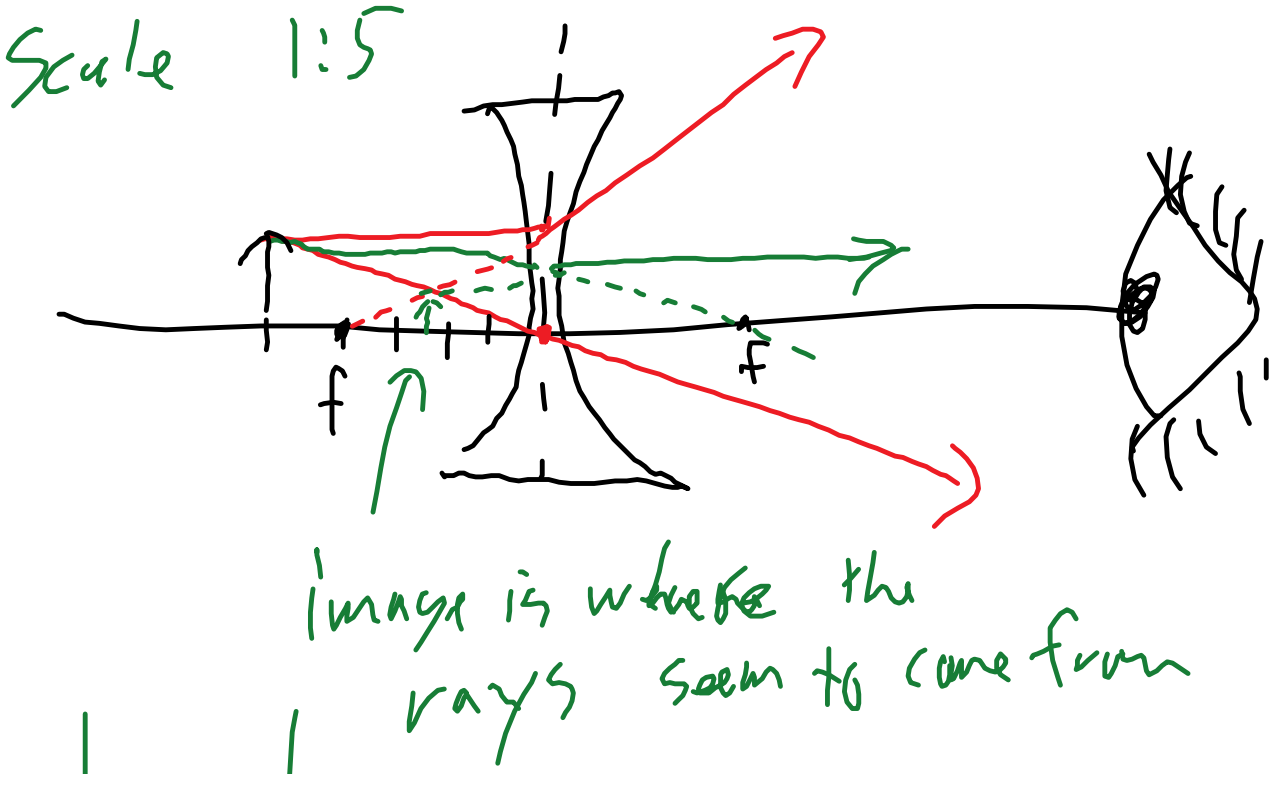
so the image you see in a concave lens is upright, smaller and virtual.

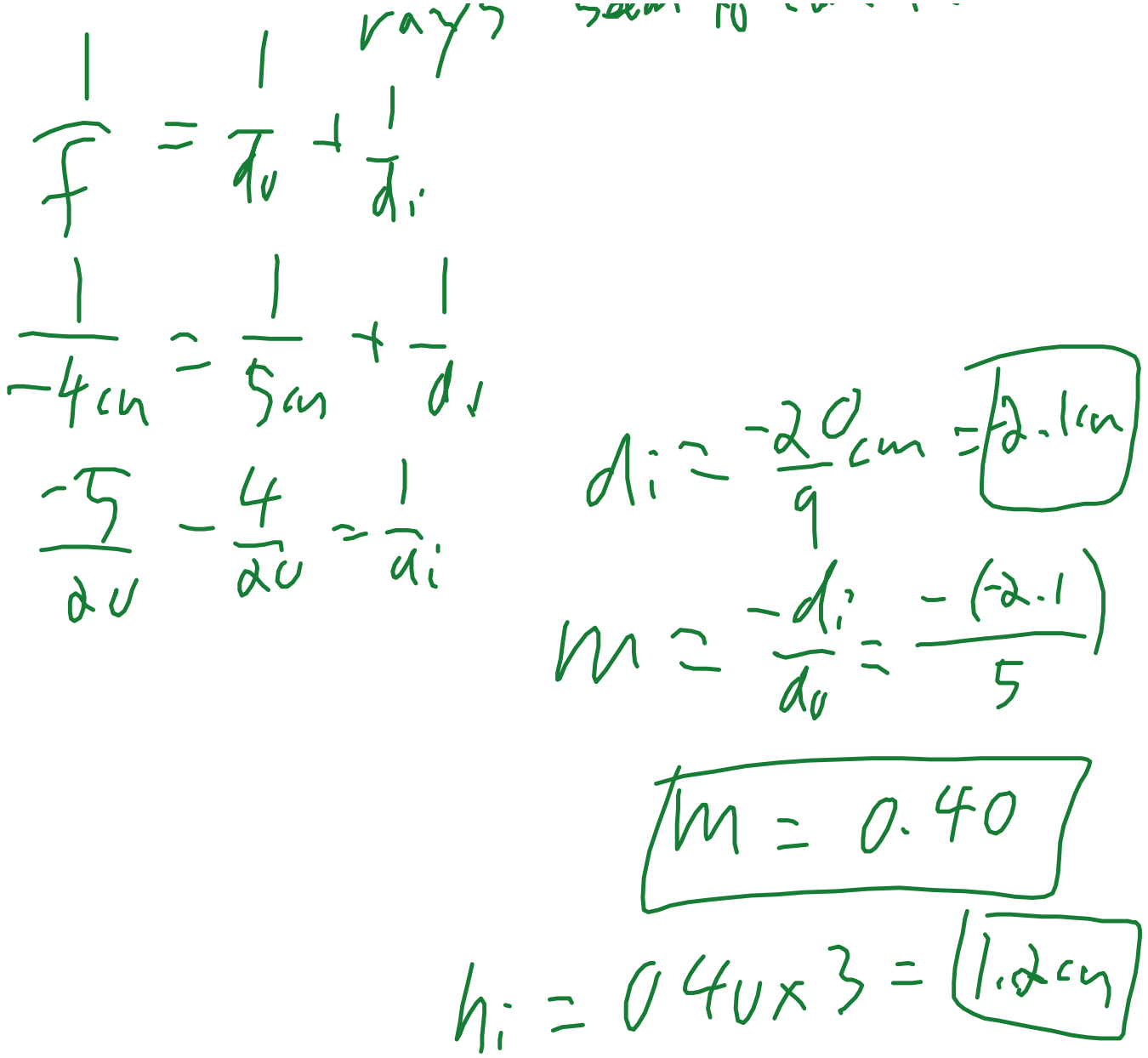
convex lens the image is

a) do>f then it is flipped and real
b) do<f the upright, enlarged and virtual

eg. A person looks through a lens at an eraser 3.0 cm high. If you are 5.0 cm from the eraser, what is the size, location and type of image if you look through

a) a concave lens focal length - 4.0 cm
b) a convex lens focal length 4.0 cm
c) a convex lens focal length 8.0 cm





Ch 18 Q13-20 and CR 2.1-2.4

Quiz Tuesday

n=c/v = 3/2=1.5
nisinθi=nrsinθr
1.0003xsinθi=1.5sin30

The distance between successive wave crests

~~opaque~~ transparent

$$f' = f\left(\frac{v + v_o}{v - v_s}\right)$$

Lenses

Quiz Tuesday - ray diagram and lens equation

recall mirrors:

look in a convex mirror - image is upright and smaller - virtual images

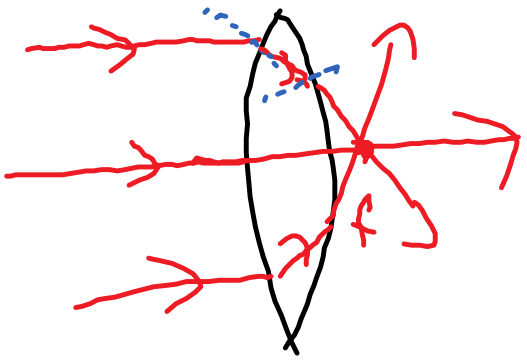
concave mirror - if do>f image is flipped - real imagae
if do<f then the image is upright and enlarged virtual

How about lenses:
look in a convex lens - you see the image
do<f it is enlarged
do>f it is flipped
look in a concave lens - the image is smaller

Watch out! it is opposite of mirrors.

Why? light refracts as it goes from air into glass.

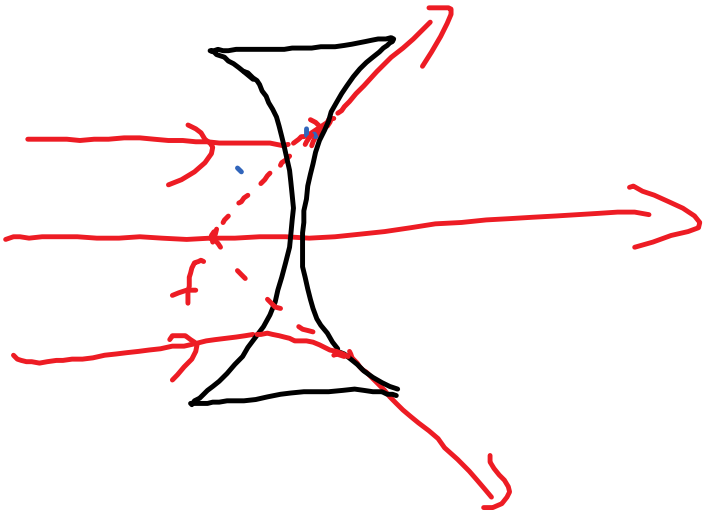
convex lens



Converging
f is positive

converging, f is positive

concave lens



diverging
f is negative

diverging, f is negative

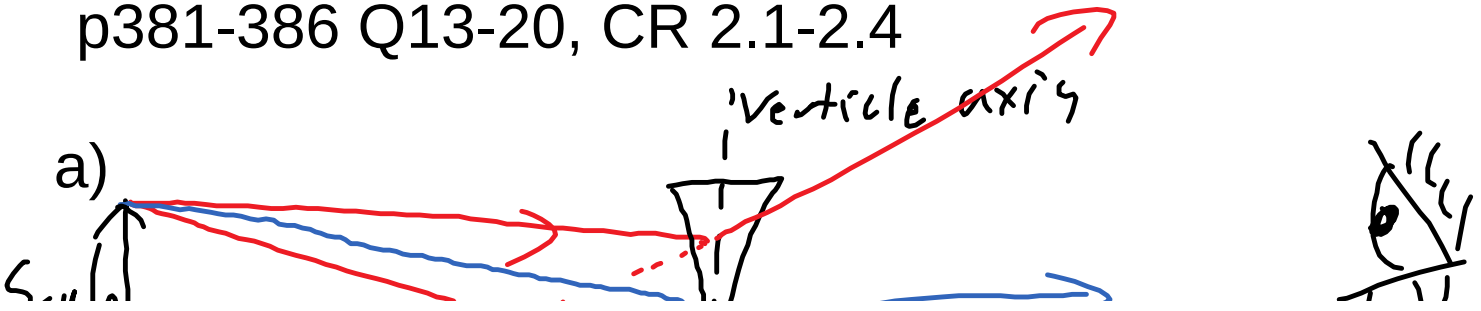
eg.

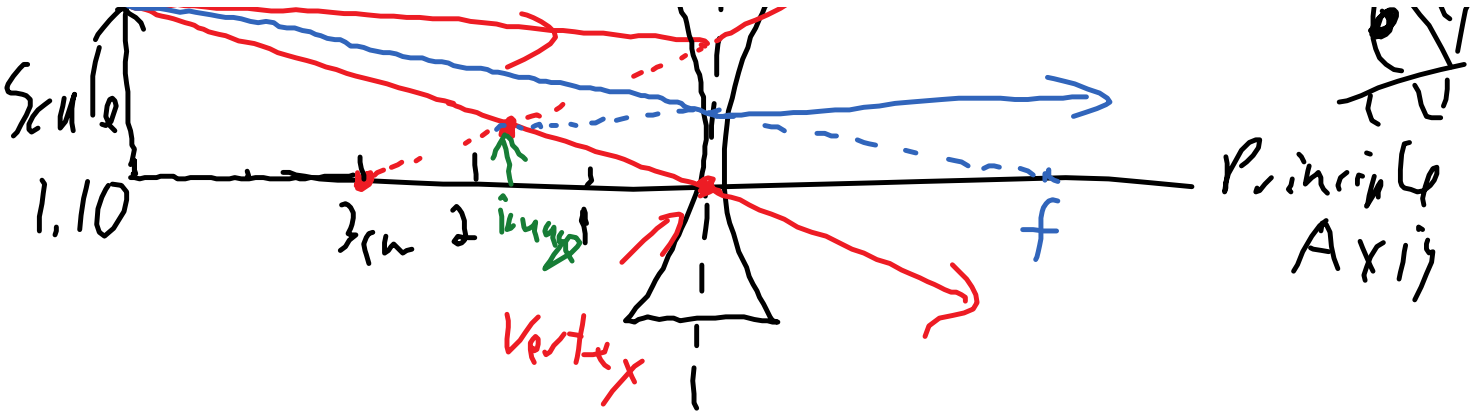
1. You look at some text with font size of 0.75cm through a lens, 5.0 cm away. What is the size, location and type of image if the lens is

a) concave f= -3.0cm
b) convex f=3.0 cm
c) convex f= 8.0 cm

p381-386 Q13-20, CR 2.1-2.4

a)





$$\frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i}$$

$$\frac{1}{-3.0\text{cm}} = \frac{1}{5\text{cm}} + \frac{1}{d_i} \qquad \frac{-5}{15} - \frac{3}{15} = \frac{1}{d_i}$$

$$d_i = \frac{-15}{8} = \boxed{-1.9\text{cm}}$$

$$M = \frac{-d_i}{d_o} = \frac{-(-1.4)}{5} = \boxed{0.38\times}$$

$$h_i = m \times h_o = 0.375 \times 0.75_4$$

$$= \boxed{0.28\text{cm}}$$

$$\boxed{\text{virtual}}$$